

## **REMARKS**

### **A. Status of Claims**

Favorable reconsideration of this application as presently amended is respectfully requested. Claims 1, 2, 3-5, 7, 8, 11, 13 and 14 are amended and new Claims 50-53 are added. Claims 10, 12, 36-42 and 45-49 are canceled. Claims 19-35 have been previously withdrawn from consideration as being drawn to a non-elected species. Claims 1-9, 11, 13-35, 43-44 and 50-53 are pending. Claims 1-9, 11, 13-18, 43-44 and 50-53 are currently under consideration.

### **B. Procedural Matters**

Applicant note, with thanks, the Examiner's acknowledgment of the acceptance of the response filed on June 13, 2008.

### **C. Claims 5 and 13-16 are Withdrawn from Allowance in View of Newly Discovered Reference**

Applicant acknowledges in the indication at Section 1 of the Office Action, that the allowability Claims 5 and 13-16 has been withdrawn in view of newly cited reference U.S. Pat. No. 5,241,953 to Nagakubo *et al.* (hereinafter "Nagakubo").

### **D. Support for Amendments to Claims 1, 2, 3-5, 7, 8, 11, 13 and 14 and for New Claims 50-53**

Support for the above amendments to Claim 1 may be found in the originally filed specification in paragraphs [0017], [0058], [0059], [0062], [0065], [0072], [0075], [0077] and [0086], in the drawings in FIGS. 10A, 10B and 10C and in Claim 1 as originally filed, as well as elsewhere in the originally filed specification, drawings and claims.<sup>1</sup>

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<sup>1</sup> All references to the specification in the present Amendment are to U.S. Published Application No. 2007/011471.

Support for the above amendments to Claim 2 may be found in the originally filed specification in paragraphs [0021], [0022], [0024], [0025], [0071], [0072] and [0076], in the drawings in FIGS. 10A, 10B and 10C and in Claim 2 as originally filed, as well as elsewhere in the originally filed specification, drawings and claims.<sup>2</sup>

Support for the above amendments to Claims 3-5, 7, 8, 11, 13 and 14 may be found in each of these respective claims as originally filed, as well as elsewhere in the originally filed specification, drawings and claims.

Support for new Claims 50 may be found in Claim 13 as originally filed, as well as elsewhere in the originally filed specification, drawings and claims.

Support for new Claims 51 may be found in Claim 14 as originally filed, as well as elsewhere in the originally filed specification, drawings and claims.

Support for new Claims 52 may be found in Claim 17 as originally filed, as well as elsewhere in the originally filed specification, drawings and claims.

Support for new Claims 53 may be found in Claim 18 as originally filed, as well as elsewhere in the originally filed specification, drawings and claims.

**E. Response to Rejection of Claims 1, 2, 6, 17 and 18 under 35 U.S.C. § 102(b) as Being Anticipated by Katada**

At Sections 2-3, the Office Action rejects Claims 1, 2, 6, 17 and 18, under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 5,383,993 to Katada *et al.* (hereinafter “**Katada**”).<sup>3</sup> This rejection is respectfully traversed with respect to the claims as currently presented.

Claims 1, 2, 6, 17 and 18, as currently presented, each claim a bonding method that includes the features of subjecting bonding surfaces of both objects to be bonded to **surface activation treatment** using **a plasma** that causes **OH groups to covalently adhere** to the bonding surfaces and performing an anodic bonding of the treated objects that causes H<sub>2</sub>O to be released and covalent bonds to be formed between the bonding surfaces, wherein both the

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<sup>2</sup> All references to the specification in the present Amendment are to U.S. Published Application No. 2007/011471.

<sup>3</sup> See Office Action, pp. 2-3.

objects to be bonded are heated at less than 400°C during or after bonding.<sup>4</sup> In contrast, **Katada** does not teach or suggest the claimed feature of subjecting bonding surfaces of both objects to be bonded to surface activation treatment using a plasma that causes OH groups to covalently adhere to the bonding surfaces, wherein both the objects to be bonded are heated at less than 400°C during or after bonding. Accordingly, **Katada** cannot teach or suggest all of the features of the claimed invention, and, therefore, Claims 1, 2, 6, 17 and 18 are patentable over **Katada** for at least this reason.

**F. Response to Rejection of Claims 1-6, 10-17, 36, 37, 40-42 and 47 under 35 U.S.C. § 103(a) as Being Unpatentable over Nagakubo in view of Henley**

At Sections 4-5, the Office Action rejects Claims 1-6, 10-17, 36, 37, 40-42 and 47 under 35 U.S.C. § 103(a) as being unpatentable over **Nagakubo** in view of U.S. Pat. No. 6,291,314 to **Henley et al.** (hereinafter “**Henley**”).<sup>5</sup> This rejection is respectfully traversed in part and rendered moot in part with respect to the claims as currently presented.

Claims 1-6, 11 and 13-17, as currently presented, and new Claims 50-53 each claim a bonding method that includes the features of subjecting bonding surfaces of both objects to be bonded to surface activation treatment using a plasma that causes OH groups to covalently adhere to the bonding surfaces and performing an anodic bonding of the treated objects that causes H<sub>2</sub>O to be released and covalent bonds to be formed between the bonding surfaces, wherein both the objects to be bonded are heated at less than 400°C during or after bonding.<sup>6</sup> In contrast, neither **Nagakubo** nor **Henley**, either taken alone or together, teaches or suggests the claimed feature of an anodic bonding that causes H<sub>2</sub>O to be released and covalent bonds to be formed between the bonding surfaces, wherein both the objects to be bonded are heated at less than 400°C during or after bonding. Accordingly, the combination of **Nagakubo** and **Henley** cannot teach or suggest all of the features of the claimed invention, and, therefore, Claims 1-6,

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<sup>4</sup> Claim 1 explicitly includes these features. Because Claims 2, 6, 17, 18 and 50-53 are at least indirectly dependent from Claim 1, these claims also include these features.

<sup>5</sup> See Office Action, pp. 3-6.

<sup>6</sup> Claim 1 explicitly includes these features. Because Claims 2-6, 11, 13-17 and 50-53 are at least indirectly dependent from Claim 1, these claims also include these features.

11, 13-17 and 50-53 are patentable over the combination of **Henley** with **Nagakubo** for at least this reason.

Claim 11 is also patentable over the combination of **Yang** for additional reasons. Claim 11, as currently presented, includes the features of “said plasma [being] a low-pressure plasma, and continuously after said surface activation treatment, the objects to be bonded [being] contacted with each other in a vacuum in the same chamber used to perform said preliminary bonding.” In rejecting Claim 11, the Office Action relies upon the following allegations:

***Allegation 1***

For claims 11 and 12, see [Fourth] embodiment and interpretation with respect to claim 4.<sup>7</sup>

***Allegation 2***

For claim 4, step a) reads on the claimed surface activation treatment, hence step b) reads on the claimed limitation regarding subjecting the bonding surfaces to a low-pressure plasma because the disclosed process steps are carried out in vacuum.<sup>8</sup>

But, contrary to what is asserted in Allegations 1 and 2, the combination of **Nagakubo** and **Henley** do not teach or suggest all of the features of the claimed invention, as currently presented, for at least the reasons discussed above with respect to Claims 1-6, 11, 13-1 and 50-53. Furthermore, as illustrated in FIGS. 1 and 11 and described in paragraph [0055] of the present application, the claimed features of “said plasma [being] a low-pressure plasma, and continuously after said surface activation treatment, the objects to be bonded [being] contacted with each other in a vacuum in the same chamber used to perform said preliminary bonding” results in a compact size and a reduction in cost for the bonding process of Claim 11. Neither **Nagakubo** nor **Henley** teach or suggest these unexpected advantages of employing these features of Claim 11. Therefore, Claim 11 is patentable over the combination of **Henley** with **Nagakubo** for this additional reason.

With respect to Claims 10, 12, 36, 37, 40-42 and 47, this rejection has been rendered moot by the cancellation of these claims.

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<sup>7</sup> See Office Action, p. 6.

<sup>8</sup> See Office Action, pp. 5-6.

**G. Response to Rejection of Claims 1, 2, 6-8, 10, 12, 17, 18, 38, 39, 45, 46, 48 and 49 under 35 U.S.C. § 103(a) as Being Unpatentable over Yang**

At Section 6, the Office Action rejects Claims 1, 2, 6-8, 17, 18, 39, 45, 46, 48 and 49 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application No. 2005/0101059 to Yang (hereinafter “**Yang**”).<sup>9</sup> This rejection is respectfully traversed in part and rendered moot in part with respect to the claims as currently presented.

Claims 1, 2, 6-8, 17 and 18, as currently presented, and new Claims 50-53 each claim a bonding method that includes the features of subjecting bonding surfaces of both objects to be bonded to surface activation treatment using a plasma that causes OH groups to covalently adhere to the bonding surfaces and performing an anodic bonding of the treated objects that causes H<sub>2</sub>O to be released and covalent bonds to be formed between the bonding surfaces, wherein both the objects to be bonded are heated at less than 400°C during or after bonding.<sup>10</sup> In contrast, **Yang** does not teach or suggest, the claimed feature of a surface activation treatment using a plasma that causes OH groups to covalently adhere to the bonding surfaces nor the claimed feature of an anodic bonding that causes H<sub>2</sub>O to be released and covalent bonds to be formed between the bonding surfaces, wherein both the objects to be bonded are heated at less than 400°C during or after bonding. Accordingly, **Yang** cannot teach or suggest all of the features of the claimed invention, and, therefore, Claims 1, 2, 6-8, 17, 18 and 50-53 are patentable over **Yang** for at least this reason.

Claim 7 is also patentable over **Yang** for additional reasons. Claim 7, as currently presented, includes the feature of “a single step of performing said preliminary bonding [being] balanced with a plurality steps of performing said main bonding.”<sup>11</sup> In rejecting Claim 7, the Office Action relies upon the following allegation:

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<sup>9</sup> See Office Action, pp. 7-9.

<sup>10</sup> Claim 1 explicitly includes these features. Because Claims 2, 6-8, 17, 18 and 50-53 are at least indirectly dependent from Claim 1, these claims also include these features.

<sup>11</sup> Emphasis added.

*Allegation 3*

For claim 7, FIG. 3c shows a single transparent member 354 is aligned and bonded to a substrate containing a plurality of MEMS devices, hence a single of the transparent member 354 on the substrate (i.e., a single preliminary bonding) results in a plurality of anodic bonding steps corresponding to each MEMS device.<sup>12</sup>

But Allegation 3 appears to be based on a misunderstanding of the features of Claim 7. As described in the specification at paragraph [0042], the term “balanced” refers to a method in which a sufficient number of main bonding devices are provided to handle the output of the preliminary bonding devices, when the preliminary bonding is performed more rapidly than the main bonding. For example, when preliminary bonding takes 10 minutes and main bonding takes 60 minutes, there should be six (6) main bonding devices for every preliminary bonding device.<sup>13</sup> FIG. 7 of the present application shows a situation in which main bonding takes three (3) times as long as a preliminary bonding, so the output of the preliminary bonding device is sent to three (3) main bonding devices. The separate steps of preliminary bonding and main bonding in the claimed invention allows for different numbers of preliminary bonding and main bonding devices to be used to increase production efficiency.<sup>14</sup> In contrast, **Yang**, including in FIG. 3c cited in Allegation 3, does not teach or suggest the “balanced” method of Claim 7. Therefore, Claim 7 is patentable over **Yang** for at least this additional reason.

Claim 8 is also patentable over **Yang** for additional reasons. Claim 8, as currently presented, includes the feature of “three or more objects to be bonded are stacked and bonded together, and objects to be bonded having the same coefficient of linear expansion sandwich an object to be bonded having a different coefficient of linear expansion from both sides thereof.”<sup>15</sup> As described in paragraphs [0045] and [0046] and shown in FIGS. 8A, 8B, 9A and 9B, the features of Claim 7 reduces warping during bonding and makes it possible to achieve high-accuracy bonding. In rejecting Claim 8, the Office Action relies upon the following allegation:

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<sup>12</sup> See Office Action, p. 8.

<sup>13</sup> See specification, paragraph [0042].

<sup>14</sup> See specification, paragraphs [0042], [0175] and [0176].

<sup>15</sup> Emphasis added.

#### *Allegation 4*

For claim 8, para. [0032] discloses that AR coating may be applied to the top surface of the transparent member. Thus, when the transparent member is bonded to the substrate, the AR coating layer is interposed between the substrate and the transparent member. Since the material of the AR coating is different from the materials of the substrate and the transparent member. Since the material of the AR coating is different from the materials of the substrate and the transparent member, the coefficient of linear expansion of the AR coating is different from that of the substrate and the transparent member.<sup>16</sup>

But Allegation 4 fails to identify any part of **Yang**, including paragraph [0032], that teach or suggest the claimed feature of two objects “having the same coefficient of linear expansion” sandwiching a third object having a different coefficient of linear expansion.” Allegation 4 appears to assert that the transparent member and the substrate are two objects with the same linear coefficient that sandwich the AR coating layer. But Allegation 4 fails to provide any evidence in **Yang**, including paragraph [0032], that the transparent member and the substrate have the same coefficient of linear expansion. Therefore, **Yang cannot teach or suggest the claimed feature of two objects “having the same coefficient of linear expansion” sandwiching a third object having a different coefficient of linear expansion.” Therefore, Claim 8 is patentable over **Yang** for at least this additional reason.**

With respect to Claims 10, 12, 45, 46, 48 and 49, this rejection has been rendered moot by the cancellation of these claims.

#### **H. Response to Rejection of Claims 9, 43 and 44 under 35 U.S.C. § 103(a) as Being Unpatentable over Yang in view of Katada**

At Section 7, the Office Action rejects Claims 9, 43 and 44 under 35 U.S.C. § 103(a) as being unpatentable over **Yang** in view of **Katada**.<sup>17</sup> This rejection is respectfully traversed with respect to the claims as currently presented.

Claims 9, 43 and 44, as currently presented, and new Claims 50-53 each claim a bonding method that includes the features of subjecting bonding surfaces of both objects to be bonded to

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<sup>16</sup> See Office Action, p. 8.

<sup>17</sup> See Office Action, p. 9.

surface activation treatment using a plasma that causes OH groups to covalently adhere to the bonding surfaces and performing an anodic bonding of the treated objects that causes H<sub>2</sub>O to be released and covalent bonds to be formed between the bonding surfaces, wherein both the objects to be bonded are heated at less than 400°C during or after bonding.<sup>18</sup> In contrast, neither Yang nor Katada, taken either alone or together, teaches or suggests the claimed feature of subjecting bonding surfaces of both objects to be bonded to surface activation treatment using a plasma that causes OH groups to covalently adhere to the bonding surfaces, wherein both the objects to be bonded are heated at less than 400°C during or after bonding. Accordingly, the combination of Katada and Yang cannot teach or suggest all of the features of the claimed invention, and, therefore, Claims 9, 43, 44 and 50-53 are patentable over the combination of Katada with Yang for at least this reason.

In addition, Claims 9, 43 and 44 also include the features of “said preliminary bonding [being] performed in a low-pressure chamber under a low pressure or in a replacing gas, and said main bonding [being] performed in the atmospheric air”. As discussed in paragraph [0049] of present application, by performing preliminary bonding in a low-pressure gas or in a replacing gas, main bonding is not contaminated with atmospheric air, because sealing is achieved in the preliminary bonding state. Particularly, when bonding is performed due to a hydrophilic treatment, since water is present at interface, the sealing effect is high. Because the main bonding is performed in the atmospheric air, these claimed features provide a reduction in cost and an increase in efficiency in comparison with processes in which the main bonding cannot be performed in atmospheric air. But Yang, as admitted at page 9 of the Office Action “is silent as to anodic bonding is performed in the atmosphere air using separate device.”<sup>19</sup> The Office Action attempts to remedy this deficiency of Yang by trying to combine Katada with Yang based on the following allegation:

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<sup>18</sup> Claims 9, 43, 44 and 50-53 are at least indirectly dependent from Claim 1 which explicitly claims these features.

<sup>19</sup> See Office Action, p. 9.



### *Allegation 5*

It would have been obvious to one of ordinary skill in the art to modify Yang's teaching by performing the anodic bonding the atmospheric air using a separate device as suggested by Katada because such bonding ambient carried out by anodic bonding is known, and the application of a [known] technique to make the same would have been within the level of one skilled in the art.<sup>20</sup>

**But Allegation 5 fails to assert a proper motivation for combining the teachings of Katada with those of Yang.** As stated in the MPEP at § 707.07(f), "obviousness [under § 103] can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is **some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art.**"<sup>21</sup> The suggestion, teaching or motivation to combine must be explicit, or at least implicit, in the references **or other verifiable evidence provided by the Examiner** relied upon to show such motivation.<sup>22</sup> "Rejections on obviousness grounds cannot be sustained by mere **conclusory statements**; instead there must be some **articulated reasoning** with some **rational underpinning** to support the legal conclusion obviousness."<sup>23</sup> Furthermore, as held by the Federal Circuit, in determining obviousness, it is **improper hindsight reasoning** to use an **Applicant's own invention** as a "**roadmap to find its prior art components**".<sup>24</sup>

Allegation 5 is merely a "conclusory statement" without any **factually supported** "rational underpinning" based on the references cited in Allegation 5, **or any other verifiable evidence provided by the Examiner.** For example, Allegation 5 fails to provide any evidence as to why the proposed modification of Yang's teaching would have been within the level of one skilled in the art. Also, the failure of Allegation 5 to provide any **factually supported** "rational underpinning" for combining these references suggests this combination has been made by improperly using Applicant's own specification as the "roadmap" to combine these references.

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<sup>20</sup> See Office Action, p. 9.

<sup>21</sup> Emphasis added. See also *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992) cited in MPEP § 707.07(f).

<sup>22</sup> See e.g., *In re Kahn*, 78 U.S.P.Q.2d 1329, 1336 (Fed. Cir. 2006) ("A suggestion, teaching, or motivation to combine the relevant prior art teachings does not have to be found explicitly in the prior art, as the teaching, motivation, or suggestion may be implicit from the prior art as a whole, rather than expressly stated by the references.")

<sup>23</sup> See e.g., *In re Kahn*, 78 U.S.P.Q.2d at 1336, emphasis added.

<sup>24</sup> See *Princeton Biochemicals Inc. v. Beckman Coulter Inc.*, 75 USPQ2d 1051, 1054 (Fed. Cir. 2005), emphasis added.

Accordingly, Allegation 5 fails to provide any properly alleged basis or “motivation” for combining the teachings of **Katada** with those of **Yang**. Therefore, Claims 9, 43 and 44 are patentable over the combination of **Katada** with **Yang** for at least this additional reason.

**I. Claims 7-9, 43 and 44 have been Rejected Based on Facts within the Personal Knowledge of the Examiner**

As discussed above in Section G, Allegation 3 and 4 are unsupported by any evidence provided by the Examiner. Accordingly, Applicant can only conclude that the Examiner is aware of facts that support Allegation 3 and 4 but have not yet been provided to the Applicant by the Examiner. Because the rejection of Claims 7 and 8 under 35 U.S.C. § 103(a) over **Yang** relies upon Allegation 3 and 4, respectively, Claims 7 and 8 have been rejected on the basis of facts within the personal knowledge of the Examiner.

Also, as discussed above in Section H, Allegation 5 is unsupported by any evidence provided by the Examiner. Accordingly, Applicant can only conclude that the Examiner is aware of facts that support Allegation 5 but have not yet been provided to the Applicant by the Examiner. Because the rejection of Claims 9, 43 and 44 under 35 U.S.C. § 103(a) over **Yang** in view of **Katada** relies upon Allegation 5, Claims 7 and 8 have been rejected on the basis of facts within the personal knowledge of the Examiner.

Therefore, Applicant hereby requests that the Examiner either: (1) provide an Affidavit under 37 C.F.R. § 104(d)(2)<sup>25</sup> that contains facts supporting the Examiner’s unsupported allegations, or (2) withdraw the rejection of Claims 7 and 8 under 35 U.S.C. § 103(a) over **Yang**. Also, Applicant hereby requests that the Examiner either: (1) provide an Affidavit under 37 C.F.R.

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<sup>25</sup> See 37 CFR § 1.104(d)(2) which states: “When a rejection in an application is based on facts within the personal knowledge of an employee of the Office, the data shall be as specific as possible, and the reference must be supported, when called for by the applicant, by the affidavit of such employee, and such affidavit shall be subject to contradiction or explanation by the affidavits of the applicant and other persons.” Applicant notes that in the unpublished case of *In re Sun*, 31 USPQ2d 1451, 1455 (Fed. Cir. 1993), the USPTO argued “the procedures established by 37 C.F.R. Section 1.107(b) (1993) [now 37 CFR § 1.104(d)(2)] *expressly entitle* an Applicant, on mere request, to an examiner affidavit that provides [citations that support the Examiner’s asserted level of skill in the art]” (emphasis added). Furthermore, in *In re Sun*, the Federal Circuit, held that “this procedure, so readily available, helps save the lack of citation in an office action from possible constitutional infirmity in denying reasonable notice and hence due process.” See 31 USPQ2d at 1455.

§ 104(d)(2) that contains facts supporting the Examiner's unsupported allegations, or (2) withdraw the rejection of Claims 7 and 8 under 35 U.S.C. § 103(a) over **Yang** in view of **Katada**.

**J. Conclusion**

In view of the foregoing amendments and remarks, Applicant respectfully requests reconsideration of this Application and the prompt allowance of at least Claims 1-9, 11, 13-18, 43-44 and 50-53.

Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Ajay A. Jagtiani at 703-591-2664 (ext. 2001) to expedite prosecution of the application.

The Commissioner is hereby authorized by this paper to charge any fees during the entire pendency of this application including fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account 10-0233-YANE-0002-US1. **This paragraph is intended to be a CONSTRUCTIVE PETITION FOR EXTENSION OF TIME in accordance with 37 C.F.R. § 1.136(a)(3) if needed.**

Respectfully submitted,

Date: June 4, 2009  
Patent Administrator  
**Jagtiani + Guttag, LLP**  
10363-A Democracy Lane  
Fairfax, VA 22030  
Telephone: (703) 591-2664  
Facsimile: (703) 591-5907  
CUSTOMER NO: 22506

/Ajay A. Jagtiani, Reg. No. 35,205/  
Ajay A. Jagtiani  
Attorney for Applicant(s)  
Reg. No.: 35,205

Customer No. 22506